CHASSIS Lubricate for SAFETY every 1,000 MILES LUBRICATION

The Institute Spokesman

NATIONAL LUBRICATING GREASE INSTITUTE

VOLUME VIII • NUMBER 7 OCTOBER, 1944

Some Technical Aspects of Launching Lubricants

By Charles W. Bohmer, Jr., *Standard Oil Company of New Jersey*

(Continued from September Issue)

Supports Which Must Be Removed Before Launching

Up to this time the weight of the ship has been supported on shoring as shown in Figure 38, and on other supports such as

Fig. 38. View showing base of shores used during construction of ship. These must be removed before the ship is launched.

cribbing and keel blocks. All of these supports must be removed before the ship is launched and as each is removed additional pressure is exerted on the launching greases until, just before the launching, the entire

Fig. 39. Removing construction shores used during the building of the ship prior to launching.

weight of the ship, cradle, and sliding ways is supported by the thin films of launching lubricants.

Figure 39 shows some of the shores being removed from under the ship by a crew

Fig. 40. Here, too, workmen are butting upright shoring loose. Note foreman timing the operation.

with a ram. This is done simultaneously at the same relative positions on the port and starboard sides. Figure 40 is another view of a similar operation.

Removal of an all-wood type keel block is shown in Figure 41. Another type of sup-

Fig. 41. Removal of an all-wood type keel block.

port that must be removed is shown in Figure 42. A sand block is used at the top in this particular type to facilitate removal. Removal of cribbing is illustrated in Figure 43. Due to the necessity for speed in this

Fig. 42. Part of support of ship during building. Note sand block at top and wedge blocks beneath to insure that block system is tight against ship.

operation the nut is being burned off.

The amount of work that must be done to transfer the weight of the ship from its construction supports to the ways can be realized from the fact that for a very large

Fig. 43. Removal of cribbing. Due to necessity for speed in this operation nut is burned off.

ship over 1,200 supports may have to be removed. Furthermore, each of the cribs and keel blocks is composed of several to

Fig. 44. View under ship during the removal of building supports. The rollers on the right were used to facilitate removal of the numerous under-ship construction supports.

Fig. 45. Close-up showing creep gauge (the two white blocks in the center of the photograph). The left block is attached to the sliding ways. Lower block is attached to the groundways.

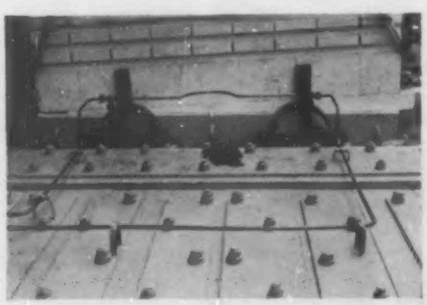


Fig. 46. Hydraulic rams at head of ways. These bear against ram supports affixed to the groundways and can exert pressure against the forward end of sliding ways, shown in the upper half of photograph.

several dozen pieces. To help remove these parts from under the ship before the launching, some yards use a roller conveyor system illustrated in Figure 44.

As the supports are removed from the ship it begins to get "alive," slack is taken up in the sliding ways, and the "liveliness" is an indication of the way the ship will start when the triggers are released or sole plate burned off. The amount of "life" or "creep" is shown by the creep gauge illustrated in Figure 45. One of the blocks is attached to the groundways and one to the

Fig. 47. Hand pump for ram system at head of ways.

sliding ways. Before any supports were removed there was no space between the two blocks. If no creep occurs after all supports have been removed it indicates there may be trouble in getting the ship to start. This might be due to many factors, one of which would be the use of improper or low-grade launching greases.

Rams, usually of the hydraulic type, are installed as illustrated in Figure 46, to give

Fig. 48. The hull superintendent telephones to points under ship to make sure everything is clear.

Fig. 49. The shipwright's foreman waits for the signal from hull superintendent to throw valve that releases trigger.

the ship a boost in case it does not start down the ways when triggers or other retaining gear are released. These are op-

Fig. 50. Sponsor swings champagne bottle and ship is on her trip down the ways.

erated, if necessary, by hand pumps shown in Figure 47.

The rams have been tested and are standing by, all of the supports have been removed from the ship, and its weight is

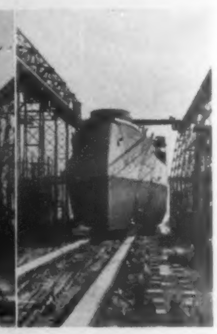



Fig. 51. There she goes! Fig. 52. Ship further down ways.

entirely on the launching greases. The only thing restraining the ship is the trigger. The time for the launching has arrived—it is a very tense moment. In the next min-

Fig. 53. Close-up still further down ways. Note chain drags on either side of ways.

ute all the work of months or even two or three years will either be consummated or ruined. The hull superintendent (Figure 48) telephones to points under the ship to

The INSTITUTE SPOKESMAN

Published monthly by

THE NATIONAL LUBRICATING GREASE INSTITUTE

GEORGE W. MILLER .... *Editor*

498 Winspear Ave., Buffalo 15, N. Y.

make sure everything is clear, the foreman shipwright (Figure 49) waits for the signal from the hull superintendent to throw the valve that releases the trigger. There she goes! The sponsor hastily swings the bottle of champagne (Figure 50) and the ship is on her trip down the ways (Figures 51 to 59).

Not all launchings are end ways. Side launchings such as shown in Figure 60 and 61 are frequent on inland waters and also in some coastal yards.

Fig. 54. Sliding ways nearly all under water.

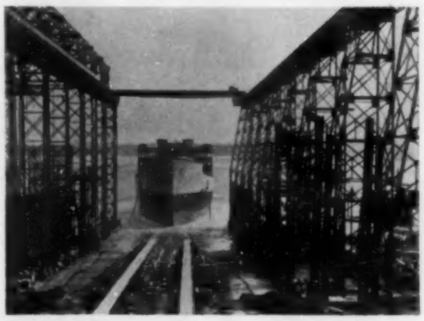


Fig. 55. Ship now practically water-borne.

Fig. 56. Note cables attached to drag chains snapping up.

Fig. 57. Cables taut. Chain drags slowing ship.

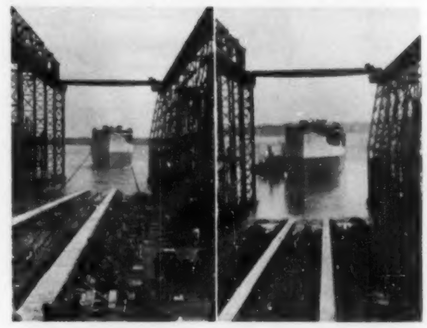


Fig. 58. Ship practically stopped. Fig. 59. Ship launched—now on way to outfitting dock.

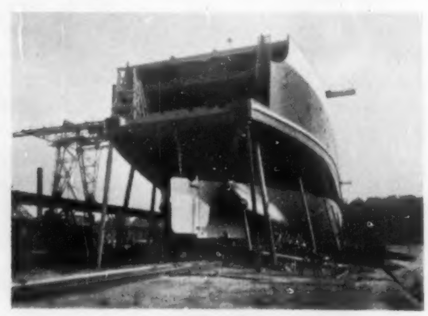


Fig. 60. Car ferry ready for side launch.

Fig. 61. A view of the ship as it hits the water—always a spectacular sight.

Satisfactory and Unsatisfactory Launching Lubricants

How launching lubricants will behave in any given launching can be determined, of course, only when the ship is launched. Even though the launching may have been satisfactory, in that the ship got in the water safely, it may be that the condition of the launching grease was such that there was little margin of safety between the satisfactory and an unsatisfactory launching. Only observation of the grease after the launching will show this. In Figure 62 the four ways are shown immediately after the launching of a battleship. The condition of the launching grease was excellent throughout the ways.

Fig. 62. The ways after the launching of a battleship. The condition of the grease was excellent.

Not all launchings are so satisfactory. Figure 63 shows ways in the pivoting area where the base coat has been scraped from the ways, allowing the sliding ways to get in contact with the groundways. This might well be serious so attempts have been made to develop laboratory tests which would correlate with the ability of a base coat to resist "squeezing out" during actual launching conditions.

Naturally the first approach was to use a laboratory press (Figure 64) to simulate pressure conditions during launching. Pressures were chosen to cover probable launching conditions, assuming an average initial unit pressure of 2.0 long tons per sq. ft. and a maximum pivoting pressure of 15 long tons per sq. ft. Table 1 (see page five) shows the results of compression tests on four base coats, using 6″ x 6″ test blocks, and a temperature of 75° to 80° F. The base coats are numbered in the order of their resistance to "squeezing out." No. 1 was by far the best, and No. 4 the worst. It is difficult to rate No. 2 because of its peculiar nature; it showed no loss up to 4.6 long tons per sq. ft. pressure and 66.1% loss between 4.6 and 10.0.

Fig. 63. A launching that was not as satisfactory. Note pivoting area where base coat was scraped away.

Fig. 64. A laboratory press to simulate pressure conditions during launchings.

Since it was expected that the compression area would have considerable effect on the compression or extrusion characteristics of plastic solids of base coat type, some tests were carried out with a larger laboratory press illustrated in Figure 65. Here the blocks were 11″ x 24″. Results of compression tests made on Base Coats No. 1 and No. 4 at 71° F. are shown in Table 2 (see page five). The differences between these values and those obtained with the 6″ x 6″ blocks are considerably greater than would be caused by the small differences in test temperatures and indicate the effect of area of compression.

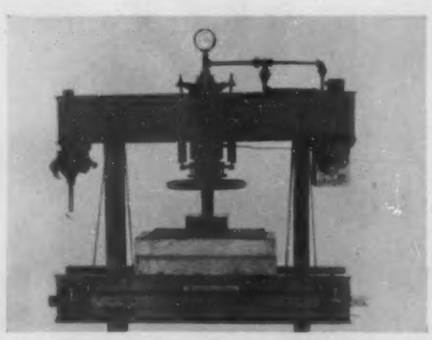


Fig. 65. A larger laboratory press for testing base coats.

These compression tests are not only quite time-consuming, but it is difficult to obtain tests over a range of temperatures corresponding to atmospheric temperatures encountered in launching practice. Consequently penetration tests were investigated as a quick method of evaluating the compression resistance of base coats. Due to the hardness of base coats a needle was used for temperature up to 80° F. and a cone used at higher temperatures. Data on needle penetrations are shown in Figure 66 for the same four base coats. Here again No. 1 is the best (hardest over the temperature range) and No. 4 the poorest.

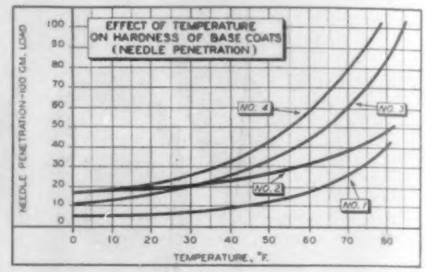


Fig. 66

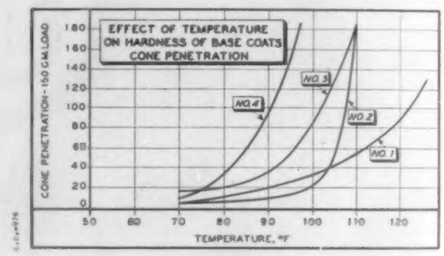


Fig. 67

In Figure 67 are data on the cone penetration of these base coats at higher temperatures. Here again No. 1 is best and No. 4 poorest. No. 2 shows the same abrupt break indicated in the compression tests.

Compression Data of Value for Reclaimed Base Coats

Since base coats are reclaimed by some yards, a measure of compression resistance is of value in connection with reclaimed as well as new base coats. In the case of the data presented here the base coats were reclaimed by scraping as much of the residual slip coat from the base coat as possible after the launching as shown in Figure 68, then scraping up the base coat and remelting it for reapplication. The danger of this is in getting so large a proportion of slip coat in the base coat because of inefficient scraping that the resultant grease will have poor compressive resistance.

Table 1

RESULTS OF COMPRESSION TESTS ON UNUSED BASE COATS USING 6" X 6" TEST BLOCKS (TEMPERATURE: 75° TO 80° F.)				
LOAD LONG TONS PER SQ. FT.	PER CENT SQUEEZED OUT			
	No. 1	No. 2	No. 3	No. 4
2.0	0	0	0	0
3.0	0	0	1.6	Slight Squeezing
4.0	0	0	8.4	6.4
4.6	0	0	21.7	46.7
10.0	3.7	66.1	57.3	90.0
15.0	22.5	76.7	77.7	93.5

Table 2

RESULTS OF COMPRESSION TESTS ON UNUSED BASE COATS USING 11" X 24" TEST BLOCKS (TEMPERATURE: 71° F.)		
LOAD LONG TONS PER SQ. FT.	PER CENT SQUEEZED OUT	
	No. 1	No. 4
3.75	0	0
5.52	0	0
7.38	0	0
9.21	0	Slight Squeezing
16.60	Slight Squeezing	22.8
21.70	2.2	—

Table 3

RESULTS OF COMPRESSION TESTS ON UNUSED AND RECLAIMED BASE COATS USING 6" X 6" TEST BLOCKS (TEMPERATURE: 75° TO 80° F.)			
LOAD LONG TONS PER SQ. FT.	PER CENT SQUEEZED OUT		
	UNUSED BASE COAT	RECLAIMED BASE COAT X	RECLAIMED BASE COAT Y
2.0	0	51.0	0
3.0	0	83.5	0
4.0	0	89.7	0
4.6	0	93.0	1.7
10.0	3.7	95.6	17.0
15.0	22.5	97.1	56.8

Fig. 68. Scraping residual slip coat from base coat, then scraping up base coat for reclaiming.

If grease is to be reclaimed, it is most important that strict controls be used to insure that material containing too much slip coat is not used.

In Table 3 are shown results of compression tests of two samples of reclaimed base coat compared with the unused base coat. Blocks 6" x 6" were used and the test temperatures were from 75° to 80°F. It is obvious that reclaimed sample X which squeezed out 51.6% at the initial load of 2 long tons per sq. ft. is no longer a suitable launching base coat. Sample Y was in fairly good condition, indicating bet-

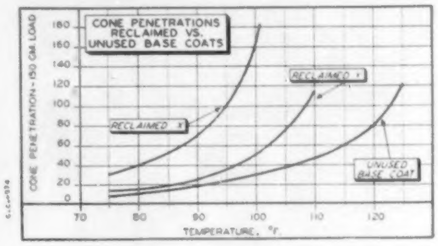


Fig. 69

ter removal of slip coat in the reclaiming operation.

Cone penetrations of the two reclaimed products compared with new base coat are given in Figure 69. The data for reclaimed sample Y line up well with compression data, but the penetration data for reclaimed sample X indicate it to be better than the compression data would justify.

Of course satisfactory compression resistance is only one of several characteristics necessary for a good, general purpose base coat. Unfortunately attempts at developing laboratory tests for characteristics such as adherence to ways under water, brittleness in cold weather, and any possible effect on starting characteristics due to interface of base coat and slip coat, have not met with sufficient success to mention them here.

Coefficient of Starting Friction of Slip Coats

It was somewhat of an anachronism to discuss base coat before slip coat since the first point of importance in a launching is whether the ship starts—if it does not, there will be no launching. Except in unusual cases base coat has little known effect on starting characteristics, which are affected mainly by slip coat so far as launching greases are concerned.

Considerable data have been accumulated with apparatus illustrated in Figure 70 on the coefficient of starting friction of slip coats, using the formula:

$$f = \frac{F}{P} \times \frac{1}{2}$$

where
f = coefficient of starting friction
F = force required to start the middle block
P = pressure exerted on the blocks

The factor $\frac{1}{2}$ is necessary since two frictional surfaces are involved.

Another laboratory has used similar but much larger apparatus shown in Figure 71.

To determine the effect of consistency of slip coat on the coefficient of starting friction a great many tests were obtained on greases of the same type differing chiefly in worked penetration. Results of these

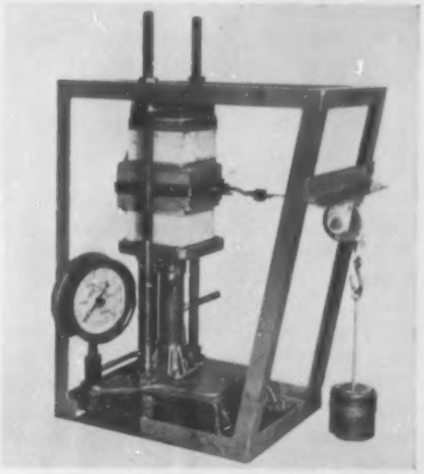


Fig. 70. With this apparatus, considerable data have been accumulated on the coefficient of starting friction of slip coat, as explained in text.

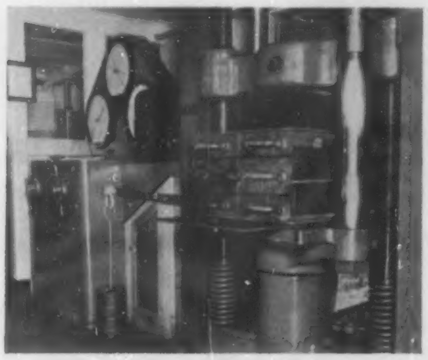


Fig. 71. Larger than the installation in Fig. 70, this apparatus was used in another laboratory.

tests are shown in Figure 72. The curves represent the average of many tests since considerable experimental error was found in running these tests, at least on the smaller apparatus. It may well be that the limit of error would be less with the larger apparatus.

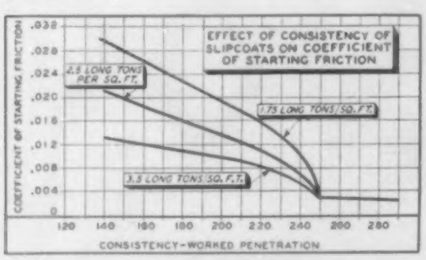
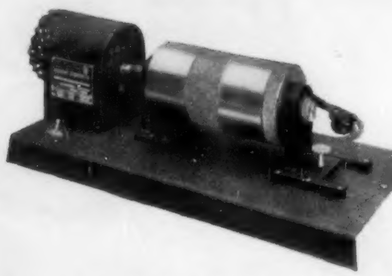


Fig. 72

The next and final installment of Mr. Bohmer's article on Launching Lubricants will appear in the November issue of THE INSTITUTE SPOKESMAN.

TESTING ★ TOPICS



ORIGINATED by the Shell Oil Company Wood River Refinery, incorporating suggestions by the International Lubricant Corp., the "Precision"—Shell Roll Tester helps improve ball and roller bearing greases by measuring the tendency of a lubricating grease to liquefy while in service. A weighted iron roller enclosed in an iron cylinder rotates at a speed of 160 r.p.m. for four hours, while the roller revolves along the wall of the cylinder, intensely kneading the grease sample. Micro penetration is then determined with an aluminum micro penetrometer cone of "Shell" design. Greases showing more than 80 points difference between unrolled and rolled portions are classified as having unsatisfactory "roller stability".